A SYNOPSIS OF THE STREBLIDAE OF THE WORLD

By QUINTA CATTELL KESSEL

This study of the Streblidæ was begun at the University of Cambridge in 1923, under the kind and painstaking direction of Dr. Hugh Scott, Curator of Entomology. As the work progressed, it assumed proportions not dreamed of in the beginning, and when I returned to this country, I decided to compile a synopsis of the family. Through the kindness of Dr. Scott, I have had the loan of the specimens belonging to the Cambridge University Museum. Mr. F. W. Edwards has generously sent me most of the material of the British Museum, and Dr. J. M. Aldrich and R. C. Shannon have loaned me what specimens they could from the National Museum. I am greatly indebted to all of these for the assistance they have given me, and also to certain members of the staff of the Department of Entomology at Cornell University, particularly Professor O. A. Johannsen, who gave many suggestions for carrying on the work.

The family Streblidæ was erected by Wiedemann in 1824 and it is still a small one, but judging by the results of comparatively recent collecting, it is destined to grow considerably.

Except for one known species, *Strebla avium,* which infests doves and parrots, the Streblidæ are all parasitic on bats in more or less tropical regions. The only record from a mammalian host other than a bat is one from an opossum, *Glironia venusta.* They have been recorded from the southern boundary of the United States, from Mexico, Central and South America, Africa, Palestine and India. Exceptions to these are records from Colorado, Kansas and Spain.

Very little is known about the life history. Kolenati, 1856, believed them to be oviparous, the larvæ living in the excrement of bats, but it seems likely that he found some other kind of larvæ, since a number of workers have found mature Streblid larvæ in the distended abdomens of the females. The wide range of structural adaptations is at least indicative that there

may be considerable variation in the mode of living of the different genera.

The Streblidæ may be easily differentiated from the Hippoboscidæ by the large leaflike palpi which project in front of the head and which do not form a sheath for the proboscis. They differ from the Nycteribiidæ in not having the head resting in a groove on the dorsum of the thorax, and except for two small genera, in the possession of wings. The Ascodipteridæ, which seem to be closely related, have a striking sexual dimorphism, the female having the proboscis curiously developed, and provided with strong curved blades, which she uses in imbedding herself under the skin of the bat. These four forms with the *Braulidæ* form the Diptera Pupipara.

Except in *Nycteribosca gigantea,* Speiser, color has not been used for distinguishing the genera or species, because it is very variable, some recently emerged specimens being remarkably pale, and improperly preserved specimens becoming almost black.

KEY TO THE GENERA OF THE STREBLIDÆ

A. Without a ctenidium of strong, black spines on the ventral surface of the head ..... Subfamily *Nycteriboscinæ* Speiser

B. Wings well developed.

C. Wings (Fig 16) with two and a part of a third well developed vein near the costal margin of the wings. Rest of the area with creases simulating veins. Apex with marked indentation. Thorax compressed ..... *Nycterophila* Ferris

CC. Wings not as described in C.

D. Wings with six longitudinal veins.

E. Posterior legs not twice as long as the anterior ones.

F. Head flattened with large lateral lobes which fit in corresponding depressions in the thorax. *Pseudostrebla* Costa Lima

FF. Head convex and freely articulated with the thorax ..... *Trichobius* Gervais

EE. Posterior legs about twice as long as the anterior ones.

F. Front femora with a diagonal row of massive spines ..... *Paratrichobius* Costa Lima

FF. Front femora without a row of massive spines.

G. With a pair of strong teeth on the anterior margin of thorax, fitting into corresponding grooves in the back of head. *Synthesiostrebla* Townsend

GG. Without the character described under G ..... *Speiseria* n. gen.

DD. With less than six longitudinal veins.

E. Wings with five longitudinal veins.

F. Head and thorax highly convex. Head freely movable. Eyes one-facetted.

Nycteribosca Speiser

FF. Head somewhat flattened, lying close to the thorax. Eyes lacking ..... *Raymondia* Frauenfeld

EE. Wings with four longitudinal veins.

Brachytarsina Macquart

BB. Wings reduced or lacking.

C. Wings reduced.

D. Wings upstanding; narrow with distinct venation (Fig 15). Posterior legs about twice as long as the anterior ones.

Pterellipsis Coquillett

DD. Wings laid flat; short. Posterior legs not twice as long as the anterior ones ..... *Aspidoptera* Coquillett

CC. Wings lacking.

D. Legs not twice as long as the anterior ones.

Paradyschiria Speiser

DD. Posterior legs about twice as long as the anterior ones.

Megistopoda Macquart

AA. With a ctenidium ..... Subfamily *Streblinae* Speiser

B. Wings well developed with six longitudinal veins.

C. Posterior legs about twice as long as the anterior ones.

Strebla Wiedemann

CC. Posterior legs not twice as long as the anterior ones.

Euctenodes Waterhouse

BB. Wings reduced ..... *Metelasmus* Coquillett

SUBFAMILY NYCTERIBOSCINAE SPEISER, 1900

Head rounded, without a ctenidium of strong, closely-set, black spines on the under side of the head. Aristas of antennae not compoundly plumose. Last tarsal segment of all the legs usually strikingly broadened, and at least as long as the three preceding together.

Genus *Nycterophila* Ferris, 1916

Genotype, *Nycterophila coxata* Ferris, 1916.

Eyes one-facetted. Thorax strongly compressed, the anterior femora short, expanded dorso-ventrally, and compressed. Wings

(Fig. 16) with a deep apical notch; with only two and a part of a third strong vein near the costal margin and the remainder of the wing with creases. The male genitalia are appressed to the ventral side of the abdomen. Only one species off *Macrotus californicus* in California; off "bats" in the British West Indies; off *Brachyphylla cavernarum* in the British West Indies; off *Chilonycteris rubiginosa rubiginosa* in Panama.

Genus *Trichobius* Gervais, 1844.

Genotype, *Trichobius parasiticus* Gervais, 1844.

Head convex, articulated freely with the thorax. Eyes containing a variable number of heaped facettes. Wings with six longitudinal veins. Hind legs not strikingly elongated.

KEY TO THE SPECIES OF TRICHOBIUS

A. Size large; over 4 mm.* Median longitudinal suture meets transverse suture.
  B. Transverse suture marked with a dark line.
    C. Eight scutellar bristles. Eight facettes in eyes. *major* Coquillett
    CC. Four scutellar bristles. Thirteen facettes in eyes. *major*, var. *quartrisetosus* n. var.
  BB. Transverse suture not marked by a black line. *corynorhini* Cockerell

AA. Less than 4 mm.
  B. Front margin of thorax straight, causing nearly square anterior angles.
    C. Thorax shiny and without noticeable bristles in middle of its area (Fig. 6) ..... *parasiticus* Gervais
    CC. Thorax with largest bristles anteriorly and laterally, but middle area with shorter bristles. Stocky build. Indistinct indentation on wings between 5th and 6th longitudinal veins (Fig. 1) ..... *dugesii* Townsend
  BB. Front margin of thorax rounded.
    C. Entire dorsal surface bristled.
      D. Dorsal surface of thorax with bristles of uniform length. Short median longitudinal suture bifurcated. Slender build (Fig. 8) ..... *cæcus* Edwards
      DD. Dorsal surface of thorax with long bristles around margins, and shorter ones in the middle. Eyes large and raised, with many facettes. Median longitudinal suture reaches one half of the way to the transverse suture (Fig. 9) ..... *phyllostomæ* n. sp.

CC. Middle of thorax apparently glabrous.
D. With bristles overhanging the scutellum.
E. Cross-vein between 4th and 5th longitudinal veins very near margin of the wing, and inclined outwards at the top (Fig. 10) ..... *sparsus* n. sp.
EE. Cross-veins not as in E. Thorax with two rows containing four bristles on each side of median suture ..... *truncatus* var. A, n. var.
DD. With many short, fine hairs before the scutellum (Fig. 4). Sixth longitudinal vein bowed slightly costad for a part of its length ..... *truncatus* n. sp.

Trichobius major Coquillett, 1899 and Brues, 1904.

Off *Myotis incautus* from Texas; off *Myotis velifer* from Kansas; off bats in Arizona and Florida. Type in the U. S. National Museum.

Trichobius major variety **quadrisetosus** new variety.

This species appears to be so close to *T. major,* that I hesitate to call it a new species, so I am giving it a varietal name, until further study may prove it synonymous, or an entirely different species. Length, 4.91 mm. There are four specimens in the British Museum, bearing only the label: "Presented by Nat. His. Branch of Mexican Geographical Commission, 1911–153."

Trichobius corynorhini Cockerell, 1910.

This species seems also to be very near *T. major* and I am doubtful if it should have more than varietal standing. Female with eleven facettes in eyes and male with fourteen. Middle cross-vein nearer base than apex of wing; the one between the fifth and sixth longitudinal veins conspicuously oblique. Off *Corynorhinus macrotis* from Colorado.

Trichobius parasiticus Gervais, 1914.

This species has been considered synonymous with *T. dugesii,* and consequently the hosts have been confused, and I have therefore omitted the host and locality records from Speiser, 1900. Off *Desmodes* sp. from Brazil and vampires from Peru.

---

* In determining the length of a specimen, I have measured from the tips of the palpi to the tips of the folded wings, thus avoiding measuring the abdomen, which is likely to be shriveled or distended.

Trichobius dugesii Townsend, 1891.

Off *Glossophaga soricina* from Mexico; off *Chilonycteris rubiginosa rubiginosa* and *Carollia perspicillatum aztecu* from Panama. This species also occurs in Brazil.

Trichobius cæcus Edwards, 1918.

Off *Chilonycteris davyi* from Dominica; off *Chilonycteris rubiginosa rubiginosa.* This species also occurs in Trinidad. Type in the British Museum.

Trichobius phyllostomae new species.

Length of female, 3.42 mm.

Head with a depression along the median line, each side bearing numerous bristles. Palpi oval, with one terminal macrochaeta. Eyes large and raised, containing twenty-four facettes. Basal part of proboscis truncate posteriorly.

Thorax (Fig. 9) somewhat longer than broad, with bristling similar to that of *Trichobius dugesii*, that is, with sparse, moderately long bristles anteriorly and laterally, and much smaller, finer ones in the middle. Mesosternum truncate anteriorly, and produced between the front coxae. Legs normal; femora spiny. Wings typical of the genus; length, 2.55 mm.; breadth at center cross-vein, 1.11 mm.

Abdomen with basal segment only weakly chitinized; as usual, the basal lateral tufts of spines are present, the dorsum bare, sides and ventral surface covered uniformly with short bristles. Apex with two distinct segments ventrally, bearing stronger bristles than the preceding portion. One pair of macrochaetae occur on the ventral side of the unchitinized penultimate segment, and the terminal one bears dorsally at its base, a pair of strong spines, directed laterally; at its middle, four directed posteriorly, while the unchitinized tips bear only soft hairs.

This species differs from *Trichobius major* in being smaller (*T. major* measures 5 mm. from tip of palps to tips of folded wings), in the possession of eyes containing twenty-four, instead of eight facettes, a proboscis truncate instead of rounded posteriorly, the median longitudinal suture of the thorax which reaches only half, instead of all the way, to the transverse suture, and in the bristling of the thorax. In *T. major*, the surface of the thorax is thickly and uniformly covered with bristles of more or less uniform length.

The specimen from which this description is written is a female in the British Museum, off *Phyllostoma,* Humboldt, Brazil, July, 1916, W. Ehrhardt—1921–200.

Trichobius sparsus new species.

Length of female, 3.24 mm.

Head without striking characteristics. Antennae practically concealed in the pits, the aristas projecting beyond. Eyes with eight facettes.

Thorax (Fig. 7) with median longitudinal suture reaching about two-thirds of the way to the transverse suture, the surface appearing shiny and glabrous, except for the few bristles shown. Wings (Fig. 10), noteworthy in that the cross-vein between the fourth and fifth longitudinal veins is very near the wing margin and inclined with it. The cross-vein between the fifth and sixth longitudinal veins is inclined strongly in the opposite direction. The margin of the wings also shows irregularities, which are noticeable. The marginal vein, instead of being rounded near the apex, is cut off, and a slight bulging of the wing appears on the posterior margin. Length of wing 2.42 mm.; breadth at center cross-vein, 1.02 mm. Legs typical of the genus.

Abdomen with basal segment indistinct, not chitinized on the ventral side, but marked as usual by the dorso-lateral tufts of spines. The abdomen of the specimen before me is greatly distended, and has two broad lobes at the apex, with numerous bristles.

T. major has the following characteristics which are different from this species: Larger size, the median longitudinal suture reaches all the way to the transverse suture and the entire thorax is uniformly covered with shorter bristles. The outer cross-veins of the wings are approximately perpendicular to the longitudinal veins.

The specimen from which this description is made is a female off *Chilonycteris rubiginosa rubiginosa,* from Chilibrillo River, Panama, September 2, 1923, bearing the names J. Zetek, I. Molino and R. C. Shannon as collectors. Type in the U. S. National Museum.

Trichobius truncatus new species.

Length of type (male), 2.50 mm.; of allotype 2.78 mm.

Sides and ventral surface of head, except for the proboscis, densely bristled, the latter shiny and smooth with two long hairs on the globular part at the base of the terminal rodlike portion. Palpi each bear three

strong spines, the interior one the smallest; at the anterio-lateral corners is a distinct notch. The eyes contain eight facettes. Between the eyes is a mass of bristles, which criss-cross each other. Back of these, there are no more bristles in the median area or on each side for a narrow transverse strip. But behind this, on each side are seven bristles of various sizes, not forming a border to the head.

Thorax (Fig. 4) rounded anteriorly, with a shallow, median indentation. Median longitudinal suture reaching two-thirds, or a little more, of the way to the transverse suture. On the notum on each side of the longitudinal suture, near the front margin, are two irregular rows of three bristles; a few other bristles occur along the edge of the notum and the usual four on the scutellum; numerous very fine hairs appear in front of the scutellum and along the transverse suture. Except for these bristles, the entire dorsal surface is shiny and glabrous. Meso- and metasternum shaped as in Fig. 5. Legs slender, except for the front femora, which are considerably thickened. The front femora also bear the strongest bristles of the legs. Wings typical of the genus; length of wing of allotype 2.22 mm.; breadth at center cross-vein .9 mm.; about half of the way to the cross-vein between the fifth and sixth longitudinal veins, the sixth is bowed slightly toward the costal margin, instead of following the even curve of the hind margin.

Abdomen of female chitinized at the base, covered uniformly with short bristles on the ventral and lateral surfaces; dorsum free from bristles; a mass of bristles at each antero-lateral angle; with prominent terminal tubercle, bearing four bristles distinctly longer than the rest; two elliptical elevations more ventrad, each bearing numerous bristles, and one particularly long one.

Abdomen of the male similar to that of the female, except for the presence of a terminal segment, which turns ventrad, and usually has a falciform process of the genitalia protruding from it.

Types with numerous paratypes in the British Museum, bearing the label: "Dominica, July, 1901. H. S. B. 1908–230." It is also recorded from Bat's Cave, near English Harbor, St. John's, Antigua, British West Indies.

Trichobius truncatus var. **A**, new variety.

The specimens in this group are very similar to those of *T. truncatus*, and it does not seem worth while to give them a name. The most noticeable differences occur in the bristling of the thorax, there being two quite regular rows of four bristles on either side of the median suture, and a row of bristles overhanging the scutellum. The middle area is covered with fine bristles which are difficult to see. The vial containing the specimens is in the British Museum. They are off *Vespertilio nigricans*, from Basin Well, Dominica (1903–89).

Genus *Pseudostrebla* Costa Lima, 1921.

Genotype, *Pseudostrebla ribeiroi* Costa Lima, 1921.

Head flattened, much wider than long, and with large lateral lobes, which are drawn out into short processes at their inner margins. Palpi triangular, the bases approximating each other, and the apices directed laterally. Thorax rectangular. Wings with six longitudinal veins. Legs not greatly elongated. Only one species off *Tonatia amblyotes* from Brazil.

Genus *Paratrichobius* Costa Lima, 1921.

Genotype, *Paratrichobius longricrus* Ribeiro, 1907.

Well-developed compound eyes. Thorax narrowed anteriorly, the mesosternum extending far between the front coxae, and covering their bases. Anterior legs with a very striking diagonal row of thick, strong, black spines; posterior legs greatly elongated, the femur and tibiae being bowed; tarsi not strikingly broadened. Wings well developed, with six longitudinal veins. Only one species off *Artibius jamaciensis,* and "leaf-nosed bat" from Brazil.

Genus *Synthesiostrebla* Townsend, 1913.

Genotype, *Synthesiostrebla amorphochili* Townsend, 1913.

Thorax much broader than long. Wings well developed with six longitudinal veins. Posterior legs nearly three times as long as the anterior ones. Front edge of the thorax with a pair of strong teeth on the median line, directed anteriorly, and fitting into corresponding grooves in the back of the head. Only one species off *Amorphochilus schnablii* from Peru.

Genus *Speiseria* new genus

Genotype, **Speiseria ambigua** new species.

In spite of the length of the hind legs, I am not placing this specimen in the Genus *Paratrichobius,* because of the absence of a diagonal row of strong spines on the front femora, and on account of the shape of the thorax, which is not longer than broad, or in *Synthesiostrebla,* because of the difference in venation, and the lack of any such modification on the anterior margin of the thorax as described by Townsend (1913) for this

genus. The thoracic and venational characters are similar to those of *Trichobius,* but the long hind legs evidently bar it from this genus. The femuro-tibial joint of the hind legs reaches as far as the point where the first longitudinal vein joins the margin of the wing. Wings well developed, with six longitudinal veins. The middle legs are also somewhat elongated, and reach about to the tip of the wings.

Head with postero-lateral parts somewhat produced and fitting into corresponding depressions of the thorax. Beginning laterad of the eyes, and especially including the labrum, the head appears to be shelved out, as contrasted with the part back of it, which is highly convex. Each of the first four segments of the tarsi shorter than the preceding one, but the last is as long as the three preceding together.

Speiseria ambigua new species.

Length, 3.43 mm.

Head bearing numerous long bristles; palpi apparently turned outward, so that the largest bristle on each takes a lateral position; eyes difficult to make out, but apparently with five facettes; antennae not prominent.

Thorax with antero-lateral depressions to receive the lateral lobes of the head (Fig. 3); anterior margin with a median indentation. Dorsal median longitudinal suture reaching to the transverse suture; covered with bristles of irregular size, much weaker and sparser in the center; with a row of strong bristles in front of the scutellum, the latter bearing the usual four long bristles, the inside two inserted distinctly posterior to the outer ones. Meso- and metasternum shaped as in Fig. 2, and projecting anteriorly between the front coxae, which are narrow and upstanding between the head and thorax, somewhat as in *Paratrichobius,* and with several strong bristles. Hind coxae with strong, short bristles on the inner margin; corresponding trochanters also with a few similar bristles. Femora and tibiae uniformly bristled, with fewer larger bristles interspersed. Length of wing, 1.85 mm.; breadth at cross-vein, 1.46 mm.

Abdomen without diagnostic characteristics so far as I am able to tell.

The specimen from which this description is written is a female, and it bears a label which is so faded that I can make out only parts of it, and those somewhat uncertainly. It follows: "Vampyrus . . . Pernambuco (Forbes)." Its designation at the British Museum is 1911–103. This species also occurs on *Carollia perspicillatum aztecum* in Porto Bello, Panama.

Genus *Nycteribosca* Speiser, 1900.

(= *Raymondia* Frauenfeld, 1855; *Strebla* Kolenati, 1856; *Brachytarsina* Kolenati, 1862).

Genotype, *Nycteribosca amboinensis* Rondani, 1878.

Both head and thorax rounded and highly convex, the head freely articulated with the thorax. Eyes one-facetted. Pro-

boscis with a large basal portion, and very short terminal tubular part. Wings with anal lobe. Anterior coxæ near together, and a curiously branched empodium is visible between the claws of all the tarsi (Fig. 25). Broadly speaking the locality is the Mediterranean regions.

KEY TO THE SPECIES OF NYCTERIBOSCA

A. Head black, with pale eyes and median longitudinal stripe. *gigantea* Speiser

AA. Head uniform in color.

B. Second longitudinal vein forked near the tip..... *diversa* Frauenfeld

BB. Second longitudinal vein not forked at the tip.

C. Wings twice as long as the body..... *africana* Walker

CC. Wings not twice as long as the body.

D. Thorax about as broad as long.*

E. Scutellum with posterior tip pointed, of a dark color, and bent ventrad..... *rouxi* Falcoz

EE. Scutellum not as described in E.

F. Third and fourth longitudinal veins divergent (Fig. 12)..... *kollari* Frauenfeld

FF. Third and fourth longitudinal veins parallel (Fig. 14)..... *alluaudi* Falcoz

DD. Thorax longer than broad..... *amboinensis* Rondani

?*surcoufi* Falcoz

The foregoing key, made out mostly from authors' descriptions, shows that the Genus *Nycteribosca* contains some well-defined species. However, I have before me eleven vials, containing specimens from various localities and hosts, which seem to be somewhat like each other, and yet differing in characters that would presumably be specific, if they were constant, but which show gradations. Very slight gradations also appear in specimens taken from the same host in the same locality at the same time, which would seem to indicate that there is a species apparently near *kollari*, which is in an unstable condition. Accordingly, I have not attempted to name the specimens, which I have been studying, but have designated them with numbers, and shall undertake a discussion of the characters.

* The scutellum is included in the length, and the breadth is taken at the transverse suture within the pleural sutures.

Although small differences occur in the shape and bristling of the thorax, the venation provides characters which are more definable. Perhaps the most noticeable character is the relation of the tips of the third and fourth longitudinal veins to each other. Numbers 1, 2, 3, 6, 7 have these veins widely divergent; in 4, 5, 10 and 11 they are only slightly divergent; in 8 and 9 the veïns are parallel. In this genus there is an anal cell at the base of the wing, and the posterior vein of this cell may carry a distinct spur at right angles to the vein as in numbers 2, 3, and 7; others have a marked thickening on the vein, which appears to vary somewhat in form, as in numbers 5, 6, 8, 10 and 11, or even this may be lacking as in numbers 1, 4 and 9. A number of authors have used the character: fifth longitudinal vein nearly reaching the margin of the wing, or not nearly reaching the margin, (Figs. 12 and 14). The latter condition appears only in 2, 3 and in *N. alluaudi.*

Following is a list of the material that I have been studying: 1. Off *Miniopterus fulginosus* from Uva, Ceylon, in the Cambridge Museum; 2. off *Rhinolophus blasii* from Jerusalem, in the Cambridge Museum; 3. off same host from Jenin, Palestine, in the Cambridge Museum; 4. off *Miniopterus schreïbersii* from Peradeniya, Ceylon, in the Cambridge Museum; 5. off same host from Maha Illupalama, Ceylon, in the Cambridge Museum; 6. Host unknown, from British Somaliland, in the British Museum; 7. off *Rhinolophus euryale* from Hammam Meskoutine, East Algeria, in the Cambridge Museum; 8. off *Hipposideros speoris speoris* from Trincomalee, Ceylon, in the Cambridge Museum; 9. off *Hipposideros lankadiva* from Peradeniya, Ceylon, in the Cambridge Museum; 10. off *Rhinolophus rouxi* or *Hipposideros speoris* from Alutnwara, Ceylon, in the Cambridge Museum; 11. off *Miniopterus* sp. from Helwak, India, in the British Museum.

Nycteribosca gigantea Speiser, 1900.

Large species, at least 4.0 mm. General color, reddish brown, except for the head which is nearly black, with a pale median dorsal strip, which makes a loop on the vertex of the head. Eyes

conspicuous on account of their light color. Meso-metasternal suture practically obliterated. Off *Cephalotes peronii* from Bismarck Archipelago; off bats from the Philippine Islands and Borneo.

Nycteribosca diversa Frauenfeld, 1856.

The branching of the second longitudinal vein is unique and this is the only record for the whole family, and since it has not been recorded since the description was written, it may be a freak. One of the specimens in vial No. 7 has a supernumary cross-vein, which shows that such irregularities may occur. Off *Cynonyctaris ægyptiaca* from Egypt.

? *Nycteribosca africana* Walker, 1849.

Placed provisionally in the genus by Speiser in 1900, as he could not see the type and the description is inconclusive. From the Cape. I was unable to find the type of this species in the British Museum.

Nycteribosca rouxi Falcoz, 1923.

Off *Notopteris neocaledonica* from New Caledonia.

Nycteribosca kollari Frauenfeld, 1855.

Bristles of thorax erect.

The characters for the key have been taken from Falcoz, 1923a. He records this species from Algeria off *Rhinolophus hipposideros, R. mehelyi,* and *Miniopterus schreibersii.* Speiser (1900) records it from the following hosts: *Phyllorhina tridens, Rhinopoma microphyllum, Vespertilio murinus,* and *Rhinolophus euryale* from Cairo, Tunis and Sardinia.

Nycteribosca alluaudi Falcoz, 1923a.

Thorax with short recumbent bristles. Second longitudinal vein turned abruptly toward costal margin. Off *Taphozous mildegardeae* in British East Africa; off *T. melandpogon* from Mandalay, Burma.

Nycteribosca amboinensis Rondani, 1878.

Off *Miniopterus schreibersii* and *Myotis adversus* in Amboina; off *Miniopterus schreibersii* in Queensland; off *Hipposideros larvatus* from Selangor; off bats from Nicobar Island.

Nycteribosca surcoufi Falcoz, 1923b.

I have not seen a specimen of this species, but it seems to be very near, if not identical with *N. amboinensis*. Specimens of the latter from Amboina, determined by Dr. Speiser, appear to agree with Falcoz's description, possessing the characters which Falcoz proposes to use to differentiate *N. surcoufi*. Off undetermined hosts from New Caledonia and Loyalty Islands.

Genus *Raymondia* Frauenfeld, 1855.

(= *Strebla* Kolenati, 1856).

Genotype, *Raymondia huberi* Frauenfeld, 1855.

Head closely articulated with the thorax, somewhat flattened, as also is the thorax. Palpi small. Eyes lacking. Front coxae widely separated. Wings short and broad with five longitudinal veins.

KEY TO THE SPECIES OF RAYMONDIA

A. With anal lobe on wings (Fig. 18) ..... *lobulata* Speiser

AA. Without an anal lobe.

B. Fourth vein of wings (Fig. 17) bent abruptly downward after branching, causing considerable enlargement of the cell anterior to it ..... *pagodarum* Speiser

BB. Fourth vein nearly straight (Fig. 17) ..... *huberi* Frauenfeld

Raymondia lobulata Speiser, 1900a.

In addition to the anal lobe of the wing, this species is readily distinguished by a row of bristles along either side of the median sternal suture. Bulbous part of the proboscis as wide as the anterior margin of the mesosternum. Scutellum with only two bristles. Off *Megaderma lyra* from Ceylon, from bats in Madras and British Somaliland.

Raymondia pagodarum Speiser, 1900.

Dorsal transverse suture of the thorax visible for its entire length. Off *Hipposideros speoris speoris* from Ceylon; off *H.*

larvatus (or *Rhinolophus malayanus*) from the Malay Peninsula; off *Emballonura nigrescens* from Molucca Islands and Amboina; off ? *Rhinolophus affinis* from Ceylon.

Raymondia huberi Frauenfeld, 1855.

Dorsal transverse suture of the thorax obliterated except toward the sides of the thorax. Off "bat" from British East Africa; off "a small broad-eared bat" from Aden; off ? *Hipposideros caffer* from Zululand; off "horseshoe-nosed bat" from Luxor, Egypt; off *Phyllorhina tridens* and *Megaderma cor;* other records from Egypt and Abyssinia.

Genus *Brachytarsina* Macquart, 1853.

Genotype, *Brachytarsina flavipennis,* Macquart, 1853.

Wings with only four longitudinal veins. Algeria. Speiser, 1908, suggests that this species may be identical with *Nycteribosca kollari.*

Genus *Pterellipsis* Coquillett, 1899.

Genotype, *Pterellipsis aranea* Coquillett, 1899.

(= *desiderata* Speiser, 1900).

Wings, four times as long as broad, projecting obliquely upwards and backwards (Fig. 15). Venation distinct. Posterior legs greatly elongated, nearly twice as long as the middle ones. Only one species collected in the West Indies, Porto Rico and Cuba from unrecorded hosts. Type in the U. S. National Museum.

Genus *Aspidoptera* Coquillett, 1899.

(= *Lepopteryx* Speiser, 1900).

Genotype, *Aspidoptera busckii* Coquillett, 1899.

Wings reduced to oblong, coriaceous organs, bearing bristles. They are appressed to the body and do not reach beyond the first fourth of the length of the abdomen; less than twice as long as broad. Legs short; femora enlarged.

KEY TO THE SPECIES OF ASPIDOPTERA

(Modified from Costa Lima, 1921.)

A. Tips of vestigal wings, truncate.
  B. Six distinct longitudinal veins. Mesonotal suture forming an inverted "T."
    C. Tibiae with long bristly hairs ..... *phyllostomatis* Perty
    CC. Tibiae only pubescent ..... *busckii* Coquillett
  BB. Veins indistinct (Fig. 13). No transverse suture on the mesonotum ..... *minuta* Costa Lima
AA. Tips of vestigal wings acute (Fig. 11). Mesonotal suture forming an inverted "Y" ..... *megastigma* Speiser

Aspidoptera phyllostomatis Perty, 1830.

Last tarsal segment not so broad as long. Off *Phyllostoma* sp. in Brazil; off *Sturnira lilium* in Paraguay; off *Glossnycteris geoffroye* in Trinidad. ?

Aspidoptera busckii Coquillett, 1899.

Speiser 1900b states that this is synonymous with *A. phyllostomatis,* but Coquillett says: "It is readily distinguished by the fact that the tibiae are only pubescent, while in *A. phyllostomatis,* four Brazilian specimens of which are before me, the tibiae are fringed with comparatively long bristly hairs." Off *Artibus,* sp. in Porto Rico. Type in the U. S. National Museum.

Aspidoptera minuta Costa Lima, 1921.

Venation practically obliterated. Female with genital segment bearing three setiferous lobes, of which the median one bears four bristles, and the laterals, eight. Off "bats" at Panama, and off *Tonatia amblyotes* in Brazil.

Aspidoptera megastigma Speiser, 1900.

Eyes lacking. Scutellum small. Mesothoracic spiracles large and striking. Venation indistinct. Off *Noctilio leporinus* of unknown locality. This bat is known to occur in Colombia.

Genus *Paradyschiria* Speiser, 1900.

Genotype *Paradyschiria dubia* Rudow, 1871.

Eyes one-facetted. Pleural sutures of the thorax moved dorsad, forming with the longitudinal suture, two oblong areas. A

pair of spiracles have also moved dorsad, and appear at the dorso-lateral corners of the above described oblong areas.

KEY TO THE SPECIES OF PARADYSCHIRIA

A. Meso-metasternal suture with a bend. Claws bearing a small tooth. *dubia* Rudow

AA. Meso-metasternal suture straight. Claws do not bear a small tooth. *lineata* n. sp.

Paradyschiria dubia Rudow, 1871.

Ventral surface of the apex of the abdomen with a small wart-like elevation. Off *Noctilio leporinus* from Colombia.

Paradyschiria lineata, new species.

The specimen from which this description is made is a female, and was caught in Cuba, by Dr. W. H. Hoffman, and is in the author's collection. The host is unfortunately not given. Several paratypes are in the collection at the Cambridge Museum.

Length of body, 1.67 mm. measured, in this case, from the tips of the palps to the end of the abdomen.

Head round and highly convex, with a pair of large, one-facetted eyes. Palpi broadly rounded, with a long, strong bristle at the tips. On either side of these are bristles about one-third as long, the inner one crossing the corresponding bristle on the other palpus. On the under side of each palpus, near the anterior margin is one strong, downwardly directed bristle. The labium is slightly indented on the median line. From the margin of the indentation containing the proboscis, four rather large bristles extend posteriorly. Slightly below and in front of the eye is a forwardly directed bristle of moderate size. There are two oblong chitinous areas between the eyes, each beset with a macrochaeta and two smaller bristles. In a postero-lateral position from each of these areas is the beginning of another chitinous part, which continues around the side of the head, apparently as the gena. This bears dorsally two macrochaetae, and two smaller bristles. Other minor bristles are present. Between the chitinous areas described, is an unchitinized space without vestiture about as large in extent as the two areas between the eyes.

Thorax. The dorsal longitudinal suture is visible for about two-thirds of the length of the dorsal oblong chitinous plates. These plates each bear a large macrochaeta near the posterior margin, a much smaller bristle further forward, while between them is one still smaller. Near the anterior margin of the thorax and beside the above mentioned oblong areas, the large spiracles stand out conspicuously, the diameter being about equal to the width of one of these areas. A more or less triangular sclerite, laterad of

the spiracle and oblong area, bears a medium sized bristle near its posterior margin, a smaller one just behind the spiracle, and one other still smaller placed somewhat laterad. The scutellum bears two macrochaetae, and the suture of the scutellum runs out to a lateral sclerite bearing two medium sized bristles. Ventrally the thorax appears normal, and the suture between the meso- and metasternum runs straight to the margin behind the middle coxæ. This aspect of the thorax is sparsely bristled with short erect bristles. Dorsally the front coxæ bear one short, strong, erect bristle, while underneath there are two noticeable bristles which bridge the space between the coxa and the anterior edge of the trochanter. Legs beset with short, stubby, erect bristles, arranged in longitudinal rows. Last segment of each tarsus abruptly depressed from its highest point to the attachment of the claws, with a crown of bristles around the depressed area. Claws simple. Pulvillæ well developed.

Abdomen. Dorsal posterior margin of the basal segment provided with strong bristles, the pair nearest the median indentation of only medium size; laterad of these, are two pairs of macrochaetæ, as well as some smaller bristles. There are few other bristles on the dorsal side of this segment, but ventrally they are quite numerous. On either side, just posterior to this segment, occurs an irregularly shaped dark marking. Dorsally, the remainder of the abdomen, except for the tip, is beset with transverse rows of bristles, which are weaker toward the median line, while underneath, the bristles are mostly weak, scattered, and sparse. At the tip of the abdomen is a dorsal more or less circular chitinous elevation with six macrochaetæ on its margin. Ventrally, near the tip, is a pair of strongly bristled, circular, chitinous areas, which are slightly elevated.

This species differs from *dubia* in the following characters, as far as I have been able to make them out from Dr. Speiser's description. In *P. dubia,* the suture between the meso- and metasternum leaves the ventral longitudinal suture at right angles, but bends abruptly, and reaches the margin of the thorax behind the middle coxæ, while in this species it is straight. Reference is made to a ventral wartlike elevation, while this species bears two ventrally and one dorsally. The claws do not bear, in the bend, a small tooth, as described by Dr. Speiser for *P. dubia.*

Genus Megistopoda Macquart, 1852.

Genotype, *Megistopoda pilatei* Macquart, 1852.

Wingless. Posterior legs greatly elongated. Off red bat in Mexico.

Strebla molossus Giglioli, 1864.

This species is problematical, though probably distinct, since it is the only record of a *Streblid* from China. Speiser 1900 placed it in the Genus Trichobius, and suggests that the host is probably *Nyctinomus cestoni* as that is the only Molossid in China. It seems unlikely that a member of a South American genus should occur in China, and Speiser 1908, without stating his reasons, transferred this species to the Genus Raymondia, but this does not help matters, because Giglioli refers to characters in his description which do not occur in the known members of this genus. I am unable to say where it belongs, since I have not seen a specimen, but I am confident that it is not a *Strebla.*

Subfamily *Streblinae* Speiser, 1900.

Head flattened, the palpi appearing as the front part of the head. Aristas, at least in Euctenodes and Strebla, compoundly plumose. A ctenidium of strong spines, similar to those on the head of a flea, occur on the ventral side of the head. Last tarsal segment only slightly thickened. Thorax distinctly longer than broad, with a groove at the sides for the reception of the anterior legs when at rest.

Genus *Strebla* Wiedemann, 1824.

Genotype, *Strebla vespertilionis* Fabricius, 1805.

Slender form (Fig. 20) as compared with *Euctenodes* (Fig. 21). Posterior legs strongly elongated.

KEY TO THE SPECIES OF STREBLA

A. Last three longitudinal veins not reaching the wing margin.
vespertilionis Fabricius

AA. Last three longitudinal veins reaching the wing margin.
avium Macquart

Strebla vespertilionis Fabricius, 1805.

Eyes with seven facettes. Antennae nearly contiguous. Fish-finlike spine, seen on edge, directed laterally, immediately behind the ctenidium (Fig. 24). Off *Vampyrops lineatus* and *Lonchoglossa caudifera.*

Localities: Colombia, Brazil, Jamaica and Mexico.

Strebla avium Macquart, 1854.

Hosts: doves and parrots.

Localities: San Domingo and Cuba.

Genus *Euctenodes* Waterhouse, 1879.

Genotype, *Euctenodes mirabilis* Waterhouse, 1879.

This genus differs from *Strebla* principally in the shortness of the posterior legs, and in the stoutness of the body (Figs. 20 and 21). Frequently confused with *Strebla,* because Waterhouse failed to show the transverse veins of the wings in his figure. This has resulted in all specimens with crossveins being placed in *Strebla.* Type in British Museum.

KEY TO THE SPECIES OF EUCTENODES

A. Anterior transverse suture of the thorax showing very faintly (Fig. 21). No long bristle on the wing margin at the tip of the third longitudinal vein.....*mirabilis* Waterhouse

AA. No trace of an anterior transverse suture on the thorax. One long bristle on wing margin at the tip of the third longitudinal vein. *tonatiæ* Kessel

More minute differences may be ascertained by a comparison of Figs. 22 and 24.

Euctenodes mirabilis Waterhouse, 1879.

Length of body, 2.75 mm.

Off *Hemiderma perspicillatum* from Pernambuco; off *Phyllostoma hastatus* from Peru; off an opossum *Glironia venusta* from Bolivia; off Vampires from San Lorenzo Islands; off *Desmodus* sp. from San Lorenzo Islands off Callao, Peru; off *Phyllostoma* sp. from Humboldt; off *Carollia perspicillatum aztecum* from Panama; off "leaf-nosed, short-tailed bat" from Paraiso, Canal Zone.

Euctenodes tonatiae Kessel, 1924.

Length of body, 2.24 mm. Angle between antennae wide; the processes of the aristas about equally distributed on each side. Wings short, broad, and rounded. Bristles on sides of abdomen

closely appressed. Off *Tonatia brasiliensis* from Ecuador. Type in British Museum.

Genus *Metelasmus* Coquillett, 1907.

Genotype, *Metelasmus pseudopterus* Coquillett, 1907.

According to the original description, there are no eyes or antennae. Hind legs not elongated. Wings reduced to oval pads, less than half as long as the thorax. Only one species off *Artibius literatus* from Paraguay. Type in the U. S. National Museum.

BIBLIOGRAPHY

1904. BRUES, C. T. Notes on Trichobius and the Systematic Position of the Streblidæ. Bull. Am. Mus. Nat. Hist., Vol. XX, p. 131–134.

1910. COCKERELL, T. D. A. A New Dipterous Parasite of Bats. Can. Ent., Vol. XLII, N. 2, p. 59.

1899. COQUILLETT, D. W. New Genera and Species of Nycteribiidæ and Streblidæ. Can. Ent., Vol. XXXI, p. 333–336.

1907. ————————. Notes and Descriptions of Hippoboscidæ and Streblidæ. Ent. News, Vol. XVIII, p. 292.

1805. FABRICIUS, J. C. Systema Antliatorum. Brunsvigae.

1923a. FALCOZ, L. Pupipara Archives de Zoologie Expérimentale et Générale. Tome 61, p. 521–552.

1923b. ————————. Dipteres Pupipares de la Nouvelle-Calédonie et des Fles Loyalty. F. Sarasin and J. Roux, Nova Calédonie, Zoology. Vol. III, L. I.

1916. FERRIS, G. F. Some Ectoparasites of Bats. Ent. News, Vol. XXVII, No. 10, p. 433–438.

1924. ————————. Two Diptera Pupipara from Philippine Bats. Philippine Jour. Sci., Vol. 24, No. 1.

1855. FRAUENFELD, G. Ueber eine neue Fliegengattung, Raymondia, aus der Familie der Coriaceen, nebst Beschreibung zweier arten derselben. Sitzgsber. d. Kais, Akad. d. Wissensch, zu Wien. Bd. XVIII, p. 320–333.

1856. ————————. Ueber Raymondia Fr., Strebla Wd. und Brachytarsina Mcq. ibid., p. 468–478.

1844. GERVAIS, P. Atlas de Zoologie, Paris.

1856. KOLENATI, F. A. Die Parasiten der Chiroptern. Brünn.

1857. ————————. Die Parasiten der Chiroptern. Dresden, Kuntze.

1862. ————————. Beiträge zur Kenntniss der Phthyriomyiarien. Horae Soc. Ent. Rossicae, Bd. II, p. 1–109.

1864. GIGLIOLI, H. On Some Parasitical Insects from China. Quart. Jour. Micr. Sci., Vol. IV, p. 18.

1924. KESSEL, Q. C. Notes on the Streblinae, a subfamily of the Streblidae (Diptera Pupipara). Parisitology, Vol. XVI, No. 4, pp. 405–414.

1921. LIMA A. DA C. Sobre os Streblidos americanos (Diptera Pupipara). Arch. de Esc. Sup. de Agric. e Med. Veter., Nictheroy, Vol. V, p. 17–34.

1835. MACQUART, J. Histoire Naturelle des Insectes, Dipteres II, Paris.

1852. ————————. Notice sur un Nouveau genre des Dipteres de la famille des Pupipares tribu des Phthiromydes, sous le nom de Megistopoda. Ann. d. l. Ent. d. France. 2ª Ser., Vol. X, p. 331–333.

1853–54. ————————. Dipteres exotiques nouveaux ou peu connus. Suppl. 4 and 5, Mem. d. l. Soc. Royale de Sciences de Lille, p. 308.

1907. MIRANDA RIBEIRO, A. Alguns dipteros interessantes. Arch. d. Mus. Nac. d. Rio de Janeiro, Vol. XIV, p. 231–239.

1908–09. NEWSTEAD, R. A Streblid (Hippoboscid) Fly Parasitic on Bats. Report of the 21st Exped. of the Liverpool Sch. of Trop. Medicine, Sect. 1—Med. and Econ. Ent., p. 468.

1830–34. PERTY, M. Delectus animalium articulorum, quae in itinere per Braziliam. J. B. de Spix et C. F. de Martins collegerunt. Monachii.

1878. RONDANI, C. Muscaria exotica Musei civici Januensis observata et distincta. Frag. IV, Hippobosca exotica non vel minus cognita. Ann. Museo. Civico di Storia Nat. di Genova, Vol. XII, p. 150–169.

1871. RUDOW, F. Einige Pupiparen auf Chiropteren schmaratzend. Zeitschr. f. d. ges. Naturw. n. Folge, Bd. 3, XXXVII, p. 121–123.

1900a. SPEISER, P. Ueber die Strebliden, Fleder-mausparasiten aus der Gruppe der Pupiparen Dipteren. Arch. f. Naturg. Vol. LXVI, p. 31–70.

1900b. ————————. Ueber die Art der Fortpflanzung bei den Strebliden, nebst synonymischen Bermerkungen, Zool. Anzeiger, Vol. XXIII, p. 153–154.

1902. ————————. Studien über dipteren pupipara. Zeitschr. f. syst. Hymenopt. u. Dipt. Vol. II, p. 158–160.

1907. ————————. Check List of North American Diptera-Pupipara. Ent. News., Vol. XVIII, p. 103–105.

1908. ————————. Die Geographische Verbeitung der Diptera Pupipara und ihre Phylogenie, Zeitschr. wiss. Insektenbiol., Vol. IV, p. 241–246; 301–305; 421–427; 437–447.

1891. TOWNSEND, C. H. T. A Remarkable New Hippoboscid from Mexico. Ent. News. Vol. II, p. 105–106.

1893. ————————. Note on Trichobius. Ent. News, Vol. III, p. 177–178.

1913. ————————. A New Genus of Streblidae. Proc. Ent. Soc. Wash., Vol. XV, p. 98–99.

1879. WATERHOUSE, C. O. On the Affinity of the Genus Polyctenes, Gigl., with a Description of a New Species. Trans. Ent. Soc. London, p. 309–312.
1824. WIEDEMANN, R. Analecta entomologica Kiliae.
1830. ————————. Aussereuropaische Zweiflügellige Insecten, Bd. II, Hamm.

EXPLANATION OF PLATES I TO IV

PLATE I.

1. *Trichobius dugesii* Townsend. Dorsum of Thorax.
2. *Speiseria,* n. gen. Meso- and metasternum.
3. *Speiseria,* n. gen. Dorsum of thorax.
4. *Trichobius truncatus* n. sp. Dorsum of thorax.
5. *Trichobius truncatus.* Meso- and metasternum.
6. *Trichobius parasiticus* Gerv. Dorsum of thorax.
7. *Trichobius sparsus* n. sp. Dorsum of thorax.
8. *Trichobius caecus* Edwards. Dorsum of thorax.
9. *Trichobius phyllostomae* n. sp. Dorsum of thorax.

PLATE II.

10. *Trichobius sparsus* n. sp.
11. *Aspidoptera megastigma* Speiser.
12. *Nycteribosca kollari* Frauenfeld.
13. *Aspidoptera minuta* Costa Lima.
14. *Nycteribosca alluaudi* Falcoz.
15. *Pterellipsis aranea* Coquillett.
16. *Nycterophila coxata* Ferris.
17. *Raymondia pagodarum* Speiser.
18. *Raymondia lobulata* Speiser.
19. *Raymondia huberi* Frauenfeld.

PLATE III.

20. *Strebla vespertilionis* Fabricius.
21. *Euctenodes mirabilis* Waterhouse.

PLATE IV.

22. *Euctenodes mirabilis* Waterhouse. Head.
23. *Euctenodes mirabilis.* Antenna.
24. *Strebla vespertilionis* Fabricius. Head.
25. *Nycteribosca amboinensis* Rondani. Tarsus, showing branched empodium.
26. *Euctenodes tonatiae* Kessel.